

References for Willamette/Lower Columbia Salmon Data Sets

This document provides references for the data sets used for the WLC-TRT's Interim Report on Viability Criteria for Willamette and Lower Columbia Basin Pacific Salmonids (McElhany et al, 2003). The datasets themselves are available at http://www.nwfsc.noaa.gov/cbd/trt/viability_report.htm. These datasets have not been updated since the McElhany et al report in March 2003 and any clarifications to data sets that arrived after that time have not been incorporated in this posting. However, any clarifications will be taken into consideration in future TRT work.

Lower Columbia River Chum Time Series References

Population	Grays River Chum
Years of Data, Length of Series	1945 - 2000, 34 years
Abundance Type	Live/dead index
Abundance References	Hymer 2000; Keller 2001; Keller and Bruce 2001
Abundance Notes	1999 and 2000 data downloaded from streamnet; references are Keller et al 2001
Hatchery Reference	Rawding 2001c
Hatchery Notes	There has been no significant contribution of hatchery fish to the Grays River chum population
Harvest Reference	Rawding 2001c
Harvest Notes	There has been no significant directed harvest on Columbia chum for the duration of the time series. Indirect harvest is believed to be negligible
Age Reference	Salo 1991
Age Notes	LCR_Willamette Chinook Chum Steelhead from Holmes and McClure

Population	Grays River Chum
Years of Data, Length of Series	1967 - 1998, 34 years
Abundance Type	Live/dead index
Abundance References	Rawding 2001
Abundance Notes	
Hatchery Reference	Rawding 2001c
Hatchery Notes	There has been no significant contribution of hatchery fish to the Grays River chum population
Harvest Reference	Rawding 2001c

Harvest Notes	There has been no significant directed harvest on Columbia chum for the duration of the time series. Indirect harvest is believed to be negligible
Age Reference	Salo 1991
Age Notes	LCR_Willamette Chinook Chum Steelhead from Holmes and McClure
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Population	Lower Gorge Tributary Chum (Hamilton Cr, Hamilton Sp. & Hardy Cr Chum)
Years of Data, Length of Series	1944 - 2000, 57 years
Abundance Type	Live/dead index
Abundance References	Rawding 2001c
Abundance Notes	Rawding provided separate time series for each subpopulation that were combined for analysis
Hatchery Reference	Rawding 2001c
Hatchery Notes	There has been no (or extremely little) hatchery impact on Hardy Creek chum.
Harvest Reference	Rawding 2001c
Harvest Notes	There has been no significant directed harvest on Columbia chum for the duration of the time series. Indirect harvest is believed to be negligible
Age Reference	Salo 1991
Age Notes	LCR_Willamette Chinook Chum Steelhead from Holmes and McClure

Lower Columbia River Chinook

Time Series References

Population	Big White Salmon River Fall Chinook
Years of Data, Length of Series	1964 - 2000, 37 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a; Norman 1982
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate. 1980-200 data from Rawding. 1964-1979 data from streamnet reference (Norman)
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference Stock	Spring Creek
Harvest Reference	Pacific Salmon Commission 2002
Harvest Notes	Estimated exploitation rate on hatchery stocks applied to natural stocks.
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1982-1990 based on an average of 1991-2000.
Population	Clackamas River Fall Chinook
Years of Data, Length of Series	1967 - 2001, 35 years
Abundance Type	Peak Count
Abundance References	ODFW 1998
Hatchery Reference	No Hatchery Data
Hatchery Notes	No Hatchery Data
Harvest Reference	No Harvest Data Available
Age Reference	Myers et al.1998
Age Notes	Generic fall age structure
Population	Coweeman River Fall Chinook
Years of Data, Length of Series	1964 - 2000, 37 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a; Kreitman 1981
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate. 1964-1979 spawning data from Kreitman; 1980-2000 from Rawding.
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding,

WDFW.

Harvest Reference Stock	Coweeman
Harvest Reference	Pacific Salmon Commission 2002
Harvest Notes	Harvest data based on PFMC models provided by Dell Simmons.
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1980-1990 and estimate based on average from 1991-2000
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Population	East Fork Lewis River Fall Chinook
Years of Data, Length of Series	1980 - 2000, 21 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate.
Hatchery Reference	Rawding 2001a
Harvest Reference Stock	Lewis Wild
Harvest Reference	Rawding 2001a.
Harvest Notes	AEQ ER for Lewis River from Dell Simmons
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1980-1983 based on an average of 1984-2000
Population	Lewis River (Brights) Fall Chinook
Years of Data, Length of Series	1964 - 2000, 37 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a; Kreitman 1981
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate. 1964-1979 spawning data from Kreitman; 1980-2000 from Rawding.
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference Stock	Lewis Wild
Harvest Reference	Pacific Salmon Commission 2002
Harvest Notes	AEQ provided by Dell Simmons
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1980-1990 and estimate based on average from 1991-2000
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Population	Middle Gorge Tributaries Fall Chinook
Years of Data, Length of Series	1964 - 2000, 37 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a; Norman 1982
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner

	abundance are extrapolations made using peak count data and marking rate. 1980-200 data from Rawding. 1964-1979 data from streamnet reference (Norman)
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference	No Harvest Data Available
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1980-1990 and estimate based on average from 1991-2000. Age distribution data missing for 1993
Population	Mill Creek Fall Chinook
Years of Data, Length of Series	1980 - 2000, 21 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate.
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference Stock	Coweeman
Harvest Reference	Pacific Salmon Commission 2002
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1982-1990 based on an average of 1991-2000.
Population	Sandy River Fall Chinook
Years of Data, Length of Series	1988 - 2001, 14 years
Abundance Type	Total from redd count
Abundance References	ODFW 1998
Abundance Notes	The estimate of spawning abundance is based on a one time peak count of live fish on the Sandy River. The index area is 10 miles from the mouth of Gordon Cr. To Lewis & Clark ramp. The number of fish is then multiplied by 2.5 to get the estimate (streamnet ref # 50070). Fish counts are provided in streamnet trend # 57517. Surveys were not conducted prior to 1988
Hatchery Reference	ODFW 1998
Hatchery Notes	Michelle McClure (NOAA Fisheries) references ODFW for proportion of natural spawners
Harvest Reference	No Harvest Data Available
Age Reference	Myers et al.1998
Age Notes	Generic fall age structure
Population	Sandy River Late Fall Chinook
Years of Data, Length of Series	1984 - 2001, 18 years

Abundance Type	Total from redd count
Abundance References	ODFW 2002; ODFW 1990; Murtagh et al. 1997
Hatchery Reference	ODFW 1998
Hatchery Notes	Michelle McClure (NOAA Fisheries) references ODFW for proportion of natural spawners
Harvest Reference	No Harvest Data Available.
Age Reference	Myers et al.1998
Age Notes	Generic fall age structure
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Population	Washougal River Fall Chinook
Years of Data, Length of Series	1964 - 2000, 37 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a; Kreitman 1981
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate. 1964-1979 spawning data from Kreitman; 1980-2000 from Rawding.
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference Stock	Cowlitz Hatchery
Harvest Reference	Pacific Salmon Commission 2002
Harvest Notes	AEQ provided by Dell Simmons
Age Reference	Rawding 2001a
Age Notes	Age distribution for 1982-1990 based on an average of 1991-2000.
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Population	Kalama River Spring Chinook
Years of Data, Length of Series	1980 - 1999, 20 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate.
Hatchery Reference	Rawding, Dan 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference	No Harvest Data Available.
Age Reference	No Age Data Available.
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Population	Lewis River Spring Chinook
Years of Data, Length of Series	1980 - 1999, 20 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner

	abundance are extrapolations made using peak count data and marking rate.
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference	No Harvest Data Available.
Age Reference	No Age Data Available.
Population	Upper Cowlitz River Spring Chinook
Years of Data, Length of Series	1980 - 1999, 20 years
Abundance Type	Peak Count
Abundance References	Rawding 2001a
Abundance Notes	Abundance data are for adults and jacks. Estimates of spawner abundance are extrapolations made using peak count data and marking rate.
Hatchery Reference	Rawding 2001a
Hatchery Notes	Hatchery data are part of the escapement data from Dan Rawding, WDFW.
Harvest Reference	No Harvest Data Available.
Age Reference	Myers et al.1998
Population	Youngs Bay Fall Chinook
Years of Data, Length of Series	1950 - 2001, 52 years
Abundance Type	Fish/Mile
Abundance References	ODFW 9999a
Population	Big Creek Fall Chinook
Years of Data, Length of Series	1970 - 2001, 32 years
Abundance Type	Fish/Mile
Abundance References	ODFW 9999a
Population	Clatskanie River Fall Chinook
Years of Data, Length of Series	1970 - 2001, 32 years
Abundance Type	Fish/Mile
Abundance References	ODFW 9999a

Lower Columbia River Steelhead

Time Series References

Population	Hood River Summer Steelhead
Years of Data, Length of Series	1992 - 2000, 9 years
Abundance Type	Dam/weir count
Abundance References	Gorman 2001
Abundance Notes	Dam counts at Powerdale dam
Hatchery Reference	Gorman 2001
Harvest Reference	No Harvest Data Available.
Age Reference	Gorman 2001
Age Notes	Repeat % total ranged from 2% to 10%.
Population	Kalama River Summer Steelhead
Years of Data, Length of Series	1977 - 2003, 27 years
Abundance Type	Trap Count
Abundance References	Rawding 2002a
Abundance Notes	Trap count plus correction estimate for jumpers
Hatchery Reference	Rawding 2002a
Hatchery Notes	Work done at RM 10 above the two hatcheries to minimize handle of hatchery fish. Substantial rearing may occur below; trapping takes place during spring
Harvest Reference	Rawding 2002a
Age Reference	Rawding 2002a
Age Notes	From 1998 forward no scales have been aged and mean ages are used for these years
Population	Washougal River Summer Steelhead
Years of Data, Length of Series	1986 - 2003, 18 years
Abundance Type	Index
Abundance References	WDFW 1997; Rawding 2002a
Hatchery Reference	No Hatchery Data.
Harvest Reference	No Harvest Data Available.
Age Reference	Busby et al.1996; Chilcote 2001; Hulett et al. 1995
Age Notes	Generic sum age structure
Population	Wind River Summer Steelhead
Years of Data, Length of Series	1989 - 2003, 15 years
Abundance Type	Mark recapture
Abundance References	Rawding 2001b; Rawding 2002a
Abundance Notes	Estimates made from mark-recapture from trap efficiency method. Adult trap at Shiperd Falls but adult population is estimate by M-R, since fish jump the falls. Not able to differentiate winter and

	summer steelhead smolts
Hatchery Reference	Rawding 2001b
Harvest Reference	Rawding 2001b
Age Reference	Rawding 2001b
Population	Clackamas River Winter Steelhead
Years of Data, Length of Series	1958 - 2001, 44 years
Abundance Type	Dam/weir count
Abundance References	Cramer 2002a
Abundance Notes	Abundance data delivered via Kathryn Kostow, Or Dept of Fish and Wildlife
Hatchery Reference	Cramer 2002a
Hatchery Notes	Pre-1997 WildFrac determined by run timing; all fish counted on or after March 1 assumed to be Wild. Additional reference for 1997-2001 from Doug Cramer, PG; have #s for wild and hatchery fish as of 1996-1997 run; all winter steelhead trapped and identified as wild or hatchery
Harvest Reference	ODFW 9999
Harvest Notes	Personal Communication. Personal communications for reconstructed run year estimates from punch cards for steelhead, 1956-1970
Age Reference	Busby et al. 1996; Chilcote 2001; Hulett et al. 1995
Age Notes	Generic sum age structure
Population	East Fork Lewis River Winter Steelhead
Years of Data, Length of Series	1985 - 1994, 10 years
Abundance Type	Peak Count
Abundance References	Johnson and Cooper 1995
Abundance Notes	Natural population only; East fork Lewis River, trib to Lewis River from mile 0.0 to mile 41.8
Hatchery Reference	Busby et al. 1996. Technical Report. Status review of west coast steelhead from Washington, Idaho, Oregon and California
Harvest Reference	No Harvest Data Available.
Age Reference	Busby et al. 1996; Chilcote 2001; Hulett et al. 1995.
Population	Hood River Summer Steelhead
Years of Data, Length of Series	1992 - 2000, 9 years
Abundance Type	Dam/weir count
Abundance References	Gorman 2001
Abundance Notes	Dam counts at Powerdale dam
Hatchery Reference	Gorman 2001
Harvest Reference	No Harvest Data Available.
Age Reference	Gorman 2001
Population	Kalama River Winter Steelhead
Years of Data, Length of Series	1977 - 2002, 26 years

Abundance Type	Trap Count
Abundance References	Rawding 2001b; Rawding 2002a
Abundance Notes	Trap count plus correction estimate for jumpers
Hatchery Reference	Rawding 2001b
Hatchery Notes	Work done at RM 10 above the two hatcheries to minimize handle of hatchery fish. Substantial rearing may occur below; trapping takes place during spring
Harvest Reference	Rawding 2001b
Age Reference	Rawding 2001b
Age Notes	From 1998 forward no scales have been aged and mean ages are used for these years
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Population	North Fork Toutle River Winter Steelhead
Years of Data, Length of Series	1989 - 2002, 14 years
Abundance Type	Total from redd count
Abundance References	Rawding 2001b; Rawding 2002a
Abundance Notes	100% trap count
Hatchery Reference	Rawding 2001b
Harvest Reference	Rawding 2001b
Age Reference	Rawding 2001b
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Population	Sandy River Winter Steelhead
Years of Data, Length of Series	1978 - 2001, 24 years
Abundance Type	Dam/weir count
Abundance References	Cramer 2002
Abundance Notes	Dam counts made at Marmot Dam
Hatchery Reference	Chilcote 1998
Harvest Reference	Berry 1978
Harvest Notes	Catch determined by multiplying harvest by wild fraction to get natural population catch estimate
Age Reference	Busby et al. 1996; Chilcote 1998; Hulett et al. 1995
Age Notes	Generic winter age structure
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Population	South Fork Toutle River Winter Steelhead
Years of Data, Length of Series	1984 - 2002, 19 years
Abundance Type	Redd Surveys
Abundance References	Rawding 2001b; Rawding 2002a
Abundance Notes	Winter steelhead in SF Toutle are by redd surveys from March 15 to May 31. Redd surveys assume that you see 100% of the redds, only wild steelhead spawn after March 15, sex ratio is 1:1, and each redd represents 0.8 females. Assumed 2% stray rate
Hatchery Reference	Rawding 2001b
Harvest Reference	Rawding 2001b
Age Reference	Rawding 2001b
Age Notes	Applied Kalama estimates to SF Toutle

Population	Washougal River Winter Steelhead
Years of Data, Length of Series	1991 - 1995, 5 years
Abundance Type	Redd index
Abundance References	WDFW 1993
Hatchery Reference	WDFW 1993
Hatchery Notes	Reports little hatchery impact
Harvest Reference	No Harvest Data Available. . .
Age Reference	Busby et al. 1996; Chilcote 2001; Hulett et al. 1995
Age Notes	Generic winter age structure
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Population	Coweeman River Winter Steelhead
Years of Data, Length of Series	1987 - 2002, 16 years
Abundance Type	Redd Surveys
Abundance References	Rawding 2001b; Rawding 2002a
Abundance Notes	Winter steelhead estimate in the Coweeman are by redd surveys from Mar 15 to May 31. Redd surveys assume that you see 100% of the redds, only wild steelhead spawn after March 15, sex ratio is 1:1, and each redd represents 0.8 females.
Hatchery Reference	Rawding 2001b
Hatchery Notes	The estimates for the Kalama are good but the Coweeman and Wind are rough. I am working on a methodology to better estimate these. The winter hatchery steelhead have a reproductive success of ~11% and the summer hatchery steelhead have a reproductive success of ~18% relative to wild fish.
Harvest Reference	Rawding 2001b
Age Reference	Rawding 2001b
Age Notes	Only age structure data is for the winters in NF Toutle and Kalama, and summers in the Kalama. Age structure is very similar in winters in Toutle and Kalama. Toutle has less repeats 5.27% to 8.9% possibly because kelts must pass through PVC tubes on the Sediment Dam which negatively impacts their survival. I chose to apply the Kalama winter to the Coweeman and SF Toutle.
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Population	East Fork Lewis River Summer Steelhead
Years of Data, Length of Series	1996 - 2003, 8 years
Abundance Type	
Abundance References	Rawding 2002a
Hatchery Reference	Rawding 2002a
Harvest Reference	Rawding 2002a
Age Reference	Rawding 2002a
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Upper Willamette River Chinook

Time Series References

Population	Clackamas River Spring Chinook
Years of Data, Length of Series	1958 - 2002, 45 years
Abundance Type	Dam/weir count
Abundance References	Cramer 2002e
Abundance Notes	Data are dam counts for NF Dam; adults only, production is mixed
Hatchery Reference	Cramer 2002e
Hatchery Notes	Counts of hatchery vs wild done only for 2001-2002 (Doug Cramer). Doug Cramer estimates the number of marked hatchery fish to be 50%.
Harvest Reference	No Harvest Data Available.
Age Reference	McClure 2002
Age Notes	Age distribution is taken from the Upper Willamette Chinook totals, not specific to Clackamas R Spring Chinook.
Population	McKenzie River Spring Chinook
Years of Data, Length of Series	1970 - 2001, 32 years
Abundance Type	Dam/weir count
Abundance References	Kostow 2002b
Abundance Notes	Data come from dam counts at Leaburg Dam. Spawning also occurs below the dam.
Hatchery Reference	Kostow 2002b
Hatchery Notes	Hatchery fish have only been 100% marked in recent years. The hatchery marks are not 100% detectable at the dam because a portion of the hatchery fish are double index marked to evaluate the fishery impact to wild fish. Double index marks mean that the hatchery fish has a coded wire tag but it is not externally marked (that is, no fin clip). Therefore, the fish "looks wild" both to the fisherman (who must release the fish) and in the raw dam count. The McKenzie fish managers therefore do several expansions to deal with these issues.
Harvest Reference	No Harvest Data Available.
Age Reference	McClure 2002
Age Notes	Age distribution is taken from the Upper Willamette Chinook totals, not specific to McKenzie R Spring Chinook.
Population	Sandy River Spring Chinook
Years of Data, Length of Series	1977 - 2001, 25 years
Abundance Type	Dam/weir count
Abundance References	Cramer 2002d

Abundance Notes	Abundance estimates only
Hatchery Reference	No Hatchery Data.
Harvest Reference	No Harvest Data Available.
Age Reference	No Age Data Available.
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Population	Willamette Falls Fall Chinook
Years of Data, Length of Series	1946 - 2001, 56 years
Abundance Type	Dam/weir count
Abundance References	Howell 1986; Bennett 1986; Bennett and Foster 1990; Bennett and Foster 1994; Bennett and Foster 1995; Foster 1998
Abundance Notes	2 additional references: Foster 2000 and Foster 2002. Data are for adults and jacks.
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Population	Willamette Falls Spring Chinook
Years of Data, Length of Series	1946 - 2001, 56 years
Abundance Type	Dam/weir count
Abundance References	Anonymous 1998a; Foster 1998; Foster 2000
Abundance Notes	Data are for adults and jacks.

Upper Willamette River Steelhead

Time Series References

Population	Calapooia River Winter Steelhead
Years of Data, Length of Series	1980 - 2000, 21 years
Abundance Type	Redd Count
Abundance References	Anonymous 1995; Anonymous 1997; Hunt 1999
Abundance Notes	data from Streamnet
Harvest Reference	Chilcote 2001
Hatchery Reference	Chilcote 2001
Population	South Santiam River Winter Steelhead
Years of Data, Length of Series	1983 - 2000, 18 years
Abundance Type	Redd Count
Abundance References	Anonymous 1995; Anonymous 1997
Abundance Notes	data from Streamnet
Harvest Reference	Chilcote 2001
Hatchery Reference	Chilcote 2001
Population	North Santiam River Winter Steelhead
Years of Data, Length of Series	1983 - 2000, 18 years
Abundance Type	Redd Count
Abundance References	Anonymous 1998a; Anonymous 1998b; Chilcote 2001
Abundance Notes	data from Streamnet
Harvest Reference	Chilcote 2001
Hatchery Reference	Chilcote 2001
Population	Molalla River Winter Steelhead
Years of Data, Length of Series	1980 - 2000, 21 years
Abundance Type	Redd Count
Abundance References	Anonymous 1997; Hunt 1999; Chilcote 2001
Harvest Reference	Chilcote 2001
Hatchery Reference	Chilcote 2001
Population	South Santiam (Foster Dam)
Years of Data, Length of Series	1973 - 2000, 28 years
Abundance Type	Total Live Fish
Abundance References	ODFW 1990; Anonymous 1997; Anonymous 1994; Chilcote 2001; Hunt 1999
Harvest Reference	Chilcote 2001
Population	Willamette Falls Dam Winter Steelhead
Years of Data, Length of Series	1971 - 2002, 32 years
Abundance Type	Dam/weir count

Abundance References Kostow 2002

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